Northeastern Forest Experiment Station

Upper Darby, Pa.

QUARTERLY REPORT

FOREST INFLUENCES AND FLOOD CONTROL SURVEYS

January 1, 1953

FLOOD CONTROL SURVEYS

by Donald E. Whelan

STATUS OF FLOOD CONTROL SURVEY REPORTS

Connecticut River.--In Secretary's Office.

Merrimack River.--Step 2 draft in review.

Salt River.--Step 8 draft submitted to Washington Office.

Allegheny River, Upper Susquehanna River, and Monongahela River.--No progress.

NE-NYIAC--Resources Survey.--Kennebec River Basin report nearly complete--other basins in process.

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In making a flood control study as part of the comprehensive interagency study of the New England-New York area, we were immediately faced with several problems. Our problems were collection and correlation of data on flood damages, agreement on location and design of flood protection for the smaller damage centers, and coordination of hydrologic analysis so that all benefits could be determined on a mutually acceptable basis. It was evident that we could not study these problems on an area of 100,000 square miles with our usual intensity, and the following procedures were adopted to get a reasonably accurate job accomplished in the available time.

FLOOD DAMAGES

Conferences were held with the District Offices of the Corps of Engineers to set up methods and to allocate work so that damages could be collected efficiently and on an acceptable basis. Damage reaches were set up mutually. Generally, U. S. Dept. of Agriculture determined all agriculture damages and the Corps all other damages. Separate stage-damage curves were determined for each damage reach and then combined.

FLOOD PROTECTION FOR SMALLER DAMAGE CENTERS

Questionnaires were sent out by all Federal and Stage agencies under the NENYIAC Flood Control Study and Work Group to local organizations and people, such as the Soil Conservation Districts, to obtain an inventory of all possible damage centers that might need flood protection. After the inventory had been compiled and duplications eliminated, teams composed of Corps of Engineers and Dept. of Agriculture personnel screened out the areas where protection obviously could not be economically justified. The remaining damage centers were then assigned either to the U. S. Dept. of Agriculture or to the Corps of Engineers, depending on the problem, or were kept as joint problems for detailed investigation and design.

HYDROLOGIC ANALYSIS

Through meetings of the NENYIAC Hydrologic Subcommittee and conferences with the Corps of Engineers, hydrologic methods were set up so that all programs could be integrated and total benefits could be determined and allocated. A proposal to the Hydrologic Subcommittee was accepted that a single method be approved for use by all agencies for determining discharge-frequency relations. A method was worked out and frequency determinations were assigned by areas to the Corps of Engineers and U. S. Dept. of Agriculture offices. A single method for flood routing has also been approved by all agencies and the Corps of Engineers has accepted responsibility for doing all flood routing for all programs. Hydrologic analysis of the effects of land treatment has been planned so that we can furnish modified hydrographs for either actual floods or the Typical Tributary Contribution Flood to the Corps of Engineers which they route down the main stem to determine the flood reductions for this part of the program.

The main features of our hydrologic methods are as follows:

1. Use of Problem Areas defined by Soil Conservation Service as homogeneous units for sampling the effect of land treatment on flood runoff.

2. Use of actual storms and floods so that hydrologic reductions can be computed, by translation, anywhere in the watershed.

3. Separation of flood hydrograph into its components of surface, subsurface, and ground-water runoff so that infiltration indices used in surface runoff computations are more in line with those actually occurring in the field, and so that the modified hydrograph can be determined based on changes in the three component hydrographs.

4. A relationship between total storm rainfall and infiltration index rate was developed for each soil-cover complex from research information. Infiltration index is that average rate which, when applied to an actual storm rainfall pattern, will produce the same volume of surface runoff as obtained from observation. The infiltration index relationships are based primarily on detailed routings of actual storm rainfall through the soil horizons of each soil-cover complex to determine the resulting surface runoff and total infiltration.

5. Development of relations of percent reduction in peak discharge of both surface and total runoff to discharge frequency. A regression analysis was made of all floods studied on all sample subwatersheds to establish the relation between the percent reduction for any frequency flood to that for the mean frequency of all floods. ~~This trent was applied to the percent reduction for any frequency flood to that for the mean frequency of all floods.~~ This trend was applied to the percent reduction for the mean frequency for each sample subwatershed to establish individual percent reduction curves for each Problem Area.

FOREST INFLUENCES

DELAWARE BASIN RESEARCH CENTER
by the Delaware Basin Staff

GENERAL

Streamflow

Complete streamflow figures for Dilldown Creek for the past hydrologic year show a much greater total runoff than in any previous year--a result of the exceptionally high rainfall on the Dilldown watershed.

Water Year	Precipitation Inches	Runoff Inches	Water Loss Inches	%
1949	49.89	25.41	24.48	49
1950	45.12	26.70	18.42	41
1951	59.97	35.94	24.03	40
1952	75.88	46.42	29.46	39

The greatest difference in the streamflow pattern between this year and previous years is the high summer streamflow. This year there was practically no decrease in streamflow during the summer, while previously the stream dropped to low flows in August and September. The total streamflow for the last month of the water year, September, was almost six times greater than any previous September total.

Ground Water

The high summer streamflow, mentioned above, was mainly the result of high ground-water levels. These, too, remained consistently higher than in previous years. At the end of the water year, generally the low point on the ground-water curve, this past year's level was seven feet higher than in any previous year. Throughout the summer there were large accretions to ground water, due to frequent and heavy storms. Going into the near year, however, a long dry period occurred during which ground-water levels dropped consistently, although still not to the low levels of previous years.

Rainfall

The long dry period, which became noticeable early in September, lasted well in November, then broke with a vengeance. October, with

only 1.41 inches of rainfall, was one of the driest months on record. A two-month total, from September 16 through November 15, amounted to only 2.5 inches. But on November 19 the rain began, continued 75 hours and amounted to 7.5 inches. This was the next-to-largest storm recorded at the Dilldown watershed, the largest having occurred in the previous quarter of this year.

Since the large storm in November, there has been no dearth of rainfall on the watershed. Seven more inches were recorded by the middle of December, resulting in a total of 16.78 inches for the first 2½ months of this water year.

SCRUB OAK CONVERSION

Fall Planting

During the last quarter, a small study was installed to test the effectiveness of fall planting in scrub oak lands. Japanese larch and three species of pine were planted at the Delaware-Lehigh Experimental Forest in the same area and under the same conditions as the plantings this past Spring. In addition to plantings in poisoned spots and in untreated brush, one hundred Japanese larch were planted in a small area that had been treated by the Seaman Rototiller. It is expected that the latter plantings will be more susceptible to frost heaving than those made in areas having had no mechanical disturbance. All plantings were made with a planting bar.

Natural Regeneration

Analysis of the third annual examination of the natural regeneration strips at the Delaware-Lehigh Experimental Forest indicates still more promise for this method of converting scrub oak areas to commercial timber stands. In the report for the second quarter of 1951, the second annual examination showed an average of 600 trees per acre within the first hundred feet of strip. This figure has increased to 800 by the last examination. The additional amount is due in part to new seedlings from last year's seed crop but mainly to the larger size of the original seedlings; they are now easier to find and tally.

Thus, wherever a seed source is present and adequate, it appears feasible to encourage pitch pine regeneration by removing the humus and root mat by bulldozer. No seedlings have ever been found in the untreated brush adjacent to the strips.

VEGETATION SURVEY

The long dry period this Fall gave us the opportunity to complete the field work for the vegetation survey. The last line across the watershed was run on November 19, a few hours before the drought was broken.

Analysis of the plot data is still to be done; however, the vegetative type map is complete. From casual observation, it may be noted that the area is considerable on which pitch pine is a significant component of the cover. The hardwood-pitch pine type has probably the largest area of any type. Although scrub oak has a lesser crown density than other hardwood species in this type, it must be remembered that the "other hardwood species" include considerable amounts of gray birch and sassafras, species which may have no more value than scrub oak.

It was interesting to note the species bordering and encroaching on the extensive boulder fields of the watershed. White pine, spruce, black birch, and black gum generally predominated, along with the ever-present red maple.

A related observation is that the largest boulder field, about six acres in extent, is surrounded by swampy land on about two-thirds of its perimeter. Standing water was observed here and there within the swampy areas on November 13, very near to the end of the dry period. This leads to the speculation that the wet area is not due to a perched water table, but rather that it is fed by ground water.

LOCAL MUNICIPAL WATERSHEDS

The Interstate Commission on the Delaware (see quarterly report for July-September, 1952) employs a forester whose duty is to promote forest, soil, and water conservation within the Delaware River Basin. Accordingly, the INCODEL forester convinced two local municipalities that they should follow a well-defined forestry program on their watershed areas, and he then prepared plans. The municipalities promptly acted on these plans. But one of the municipalities failed in one of the basic tenets of good management; they did not inspect to see whether the plans were being executed properly. Mr. Frantz (the INCODEL forester) and Bethlahmy inspected the work being done on the Bethlehem City Watershed. It is difficult to conceive of a sorrier sight! Clear-cut, surface bared boulevards 35 feet wide with grades up to 25 percent and with no provision at all for surface drainage. The bulldozer operator builds these boulevards without any supervision, and without any conception of the watershed damages involved. Mr. Frantz informed the City Council of the sad state of affairs. The city will probably get around to correcting what has happened, but in the meantime, the damage has been done. This incident, however, serves as a good example of what can and will happen to the very best of plans if their execution is not properly supervised.

REPORTS AND MANUSCRIPTS

a) McQuilkin (of the Anthracite Center) and Bethlahmy inspected the Krilium treated minebanks at Wanamie, Pa. The conclusion was

that the use of Krilium retards and perhaps prevents minebank erosion. A check on seedlings planted on spoil banks revealed that Krilium does not affect survival.

b) A report was completed recommending certain changes in the construction of Colman fiberglas soil moisture units in order to standardize this performance. The report was send to the California Station for their comments.

c) A short discussion of an article appearing in the A.G.U. Trans. was prepared. The paper draws attention to the difficulties inherent in analyzing resistances of moisture units in frozen ground.

d) The soil map of Dilldown watershed was redrawn to conform with the completed boundary survey.

MEETINGS

a) A local radio station (WGPA) owns a farm in the vicinity of Lehigh University campus; they want to grant the land to the University for whatever purpose they see fit. Bethlahmy accompanied Prof. Jenkins of the Geology Department and representatives of the U.S.G.S. and INCODEL to determine whether the farm is suitable for hydrologic research. As a result of the survey, the University will not accept the offer.

b) Bethlahmy spent a day with the U.S.G.S. personnel who are doing research at Seabrook Farms, N. J. This farm processes fresh vegetables for quick freezing. A large amount of water must be disposed of daily. The system used is to pump the water to a nearby woodlot and then sprinkle the water under pressure. The soil has been able to take all the water that has been applied.

c) A paper on measurement of evapo-transpiration losses at Dilldown was presented at the annual meeting of the Soil Science Society of America.

INSPECTIONS

Dr. Marquis spent a few hours at the Center going over our work program. Duffy gave us a thorough-going administrative inspection. Lyford and Smith (BPISAE Soil Survey Division), Denny (USGS), Higbee (Pa. State College), and Goodlin (Harvard) spent a day at the Dilldown watershed and the boulder field at Hickory Run State Park. Dr. Denny believes that frost action during periglacial climate had much to do with the formation of the soils at Dilldown.

PERSONNEL

Miss Perma Zerfass, formerly with the S.C.S. in Allentown, joined the Delaware Basin staff. We now wonder how we ever got along without her.

MOUNTAIN STATE RESEARCH CENTER

by the Staff

GENERAL

The Mountain State Research Center is ending its third year of compartment management studies just about on schedule. To date, five compartments have had their initial cut. The largest compartment to be cut over todate is about half completed. It and the fourth one in our second series of compartments will be completed by spring. The two farm woods compartments are ready for their fourth cut.

The biggest excitement of the quarter was the unusual fire season experienced in West Virginia, as well as a large section of the Eastern United States. The Fernow experienced an acre and a quarter fire which was outside any proposed study areas. Quick action on the part of Carl R. Barr, who has excellent relationships in the community of Parsons, prevented a conflagration. Round the clock patrolling may have prevented further fires.

During the season, five of the Center personnel were called upon to assist the Monongahela National Forest in several fires. Carl Barr acted successively as camp boss and fire boss on one 4,000 acre fire.

PUBLICATIONS

An article "How Many Trees are Destroyed in Logging" by Weitzman and Holcomb has been published as Station Note #17.

An article "Mountain Logging" by Weitzman appeared in the Christmas issue 1952 of the Southern Lumberman.

The following articles have been submitted for publication in the West Virginia Conservation magazine: "Managing for Mine Timber Production" and "Managing the Farm Woodland."

SHOW-ME TRIPS

During the quarter, six show-me trips were conducted with a total of 14 men in attendance. The largest group was made up of FUS personnel in Elkins for a regional meeting. Two meetings were also conducted for commercial logging operators.

MEETINGS

Sid Weitzman and G. R. Trimble, Jr. attended the 1952 national meeting of the Soil Science Society of America, Forest Soils Division, where they presented a paper "Soil Erosion on Skid Roads." They were accompanied by "Jay" Lopez.

PERSONNEL

"Jay" Lopez of the Universidad Los Andes, Mender, Venezuela, is still with us. He now has 3½ months of training in forest management and forest influences behind him. Jay will be with us until the first of February, 1953.